FEATHER TEXTURES – A POSSIBLE SHOCK FEATURE IN QUARTZ DIAGNOSTIC OF LOW SHOCK PRESSURES. M. H. Poelchau[1], T. Kenkmann[1]. [1]Museum für Naturkunde, Leibniz Institute at Humboldt University Berlin, Invalidenstr. 43, 10115 Berlin, Germany. michael.poelchau@mfn-berlin.de.

The term "feather textures" describes an unusual type of planar microdeformation structure, which has been found in shocked quartz grains in several confirmed impact craters. These features were first described in detail by [1,2], although, to the best of our knowledge they were first reported by [3]. Feather textures consist of a planar fracture ("P1" in [1,2]) from which a group of thinly spaced lamellae ("P2" in [1,2]) branch off, typically only from one side. Reports of these features in impact craters include Goyder [3], Rock Elm [1,2], Matt Wilson [4,5], Wetumpka [6], Kentland [7] and Jebel Waqf as Suwwan [8]. In all of these reports P1 features have crystallographic orientations with maxima at c (0001), r/z $\{101;\bar{1}1\}$ and ξ $\{112;\bar{2}2\}$ when indexed, or otherwise angles with maxima at 0° and ~50° to the quartz c-axis. ω $\{101;\bar{3}3\}$ and π $\{101;\bar{2}2\}$ orientations are very rare. P2 features can be slightly curved, have a spacing between 2 and 10 µm, are much shorter than the P1 features from which they emanate, and thus show a striking resemblance to planar deformation features (PDFs).

Lithologies in which feather textures occur are typically quartzites, coarse-grained, well-consolidated sandstones, and impact breccias. We have also observed these structures in gneissic clasts in the Nördlinger Ries suevite, where they occur in highly shocked grains alongside multiple sets of PDFs, and therefore raise the question if they are actually "incipient PDFs" as proposed by [1,2].

To reproduce feather textures plane-wave shock recovery experiments were carried out at the EMI-Freiburg in 2000 at various conditions using the impedance matching technique on cylindrical samples of single crystal quartz. A 3 mm slice of K-feldspar subdivides the quartz crystal in two parts to achieve large shear displacements within both minerals and along their interface. Feather textures occur in experiments with pressures <16 GPa at sites where shear deformation is concentrated. Our preliminary data are in accordance with the hypothesis in [2] that feather textures may form between 5 and 10 GPa.

Our preliminary analyses of both experimental and natural samples has led us to the conclusion that these structures are formed as conjugate shear fractures. The dominant P1 feature often shows an offset due to shearing, while P2 features occur on one side, occasionally show "dragging" at the base of the P1 feature which is related to the sense of shear, and have angles of 40-75° to P1 typically seen in conjugate fracture systems.

Further analysis, at the TEM is planned to confirm if the P2 features are fractures or are amorphous lamellae like PDFs.

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